



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Previous to the commencement of the ordinary business, the President addressed the Meeting as follows, on the subject of the Faraday Memorial :—

“Before we proceed to the ordinary business of this evening, I beg to perform a duty which I have undertaken most heartily. When the world of science was deprived of that illustrious man, Michael Faraday, I was honoured by being named one of those Presidents of Societies who were appointed to organize the public meeting which was presided over by his Royal Highness the Prince of Wales, and at which it was resolved, in this very theatre, to erect a statue in memory of the great philosopher, in the Cathedral Church of St. Paul.

“On that occasion the feeling in favour of this resolution was strong and unanimous, and the object was most eloquently sustained by the eminent French chemist Dumas, one of the Perpetual Secretaries of the Institute of France.

“I regret to say, however, that at this moment the subscription-fund must be considerably increased, to enable us to pay for a suitable monument in marble by an eminent sculptor.

“As one who learnt his first lessons in science under Faraday, and who, in every succeeding year, admired more and more his great genius, as well as the simplicity and benignity of his character, I call upon you, my associates of the Royal Geographical Society, and your friends who may not have subscribed, to do honour to yourselves by supporting this good cause. In doing so, I beg you to recollect that it was in this very theatre that Faraday delighted and instructed vast audiences for upwards of 30 years; and that in this theatre, so adorned by him, we Geographers have now the privilege of holding our meetings, owing to the liberality of the President and Managers of the Royal Institution.

“Subscriptions for the Faraday Memorial are received by the Assistant Secretary of the Royal Geographical Society, and also by the Accountant of the Royal Institution.”

The following paper was read :—

Notes of a Journey to the New Course of the Yellow River in 1868.

By NEY ELIAS, Esq., F.R.G.S.

[EXTRACTS.]

It is well known that the Lower Yellow River, flowing through the great eastern plain of China, has many times changed its course during the historic era. No less than nine such changes are recorded by the Chinese as having taken place during the last 2500 years; the first dating about 602 B.C.,* and the ninth, 1851-3 A.D.; the positions of the mouths resulting from them having ranged over an extent of coast-line comprised between some 5 degrees of latitude. Thus the most northern is recorded to have been in about latitude 39°, which would coincide approximately with the present mouth of the Peiho; whilst the most southern is represented to be that which existed before the last change, and which is marked on all modern maps in latitude 34°. There is reason, however, to believe that

* See ‘Geological Researches in China, &c.,’ by Raphael Pumpelly.

this southern mouth was the outlet at some periods of only a portion of the Yellow waters, another portion finding its way simultaneously still further southward, viz., through the Hung-tsze Lake into the Yang-tsze, which, as will be shown below, is the case at the present day.

The causes of the earlier changes, their dates, and other details, I will not go into here, but will limit myself to a few remarks on the last diversion, and the resultant course.

This diversion was first brought to the notice of foreigners in China by Dr. Macgowan in the 'North China Herald' of 3rd January, 1857, and was ascribed hypothetically to various causes, all of which have been shown by the late examination to have had little or no connection with it.

The date of the occurrence was, for some time, a matter of uncertainty; some authorities placing it in 1851, others in 1852 and 1853, and even later. But, on a short journey, which I made in 1867, to Tsin-kiang-pu, and the neighbouring portion of the old bed of the Yellow River, I was enabled, after questioning numbers of different persons living in the vicinity, at different times and under different circumstances, to ascertain with, I think, some certainty, that the change was gradually accomplished, and extended over the years 1851 to 1853.

This information was corroborated on my last journey, and might be summed up somewhat as follows. During the summer flood of 1851, the first rupture took place in the north bank, near Lan-yang-hein, in Honan, and a portion of the water flowed through the breach on to the plain; the flood of 1852 extended the breach, and further diminished the supply on the lower river, and that of 1853 enlarged it to such an extent as to allow the whole body of water to flow over the lowlands to the northward and eastward, until it found a channel in the Ta-tsing River, which conducted it to the sea in the Gulf of Petcheli.

Thus, not until after the flood of 1853, can the new course be said to have wholly established itself, and the old one to have become entirely dry.

This new course having become a subject of interest to a portion of the foreign community of Shanghai, it was decided, in the early part of last year, to send an exploring party to examine and lay it down; all information upon it received up to that time having been of a vague and unsatisfactory nature.

In accordance with this decision, I had the honour of being requested to undertake the task, and my plan for carrying it out being approved of, a small party was formed for the purpose, consisting of Mr. H. G. Hollingworth, two Chinese, and myself.

The plan of the journey was to go to Chinkiang by steamer, from there to proceed up the Grand Canal until reaching the Yellow River; to follow the river down to the neighbourhood of its mouth in the Gulf of Petcheli, and up again as far as the point where it diverges from its old course (which was reported to be near I-fung-hien, in Honan), returning by the river and Grand Canal to Chinkiang. This plan, having afterwards been found practicable, was carried out.

As most of the rivers in China are known to be in flood during the summer months, and consequently in an unfavourable state for exploring operations, and as those in the northern districts are generally frozen over by about the middle of December, the autumn was considered the most advantageous season for the journey, and consequently the party started from Shanghai on the 24th September.

A journey of nearly 400 miles on the Grand Canal brought our party, on the 17th October, to the southern bank, or rather "limit," of the new Yellow River, near a small but busy town called Nan Shan. The river, at this point, has no defined bed, but flows over a belt of country some ten to twelve miles in width, having merely the appearance of a flat level district in a state of inundation.

Along this fifteen miles the canal banks have been carried away in a number of places by the Yellow River breaking across them. The gaps are sometimes half-a-mile or more wide, and the current rushing through these almost obliterates the course of the canal, and renders navigation upon it difficult.

For dreariness and desolation no scene can exceed that which the Yellow River here presents, everything natural and artificial is at the mercy of the muddy dun-coloured waters as they sweep on their course towards the sea—a flood not likely to subside, and a doubly mischievous one, from the fact of its ever moving onwards with a swift current.

The Grand Canal is now dry, from the Yellow River northwards, as far as Lin-tsin-chow; or, in other words, it ends there, that portion north of the summit-level being merely a tributary of the Yellow River. During the two months of the year, however, when the river is in flood and at its highest level, enough water, it is said, flows into the dry bed of the canal to form a navigable stream as far as Lin-tsin, where it connects with the Wai-ho. Thus, for some ten months of each year, there is no water-communication towards the north beyond the Yellow River.

Near the southern "limit" of the river is a channel running in a general N.N.E. direction, down which junks of a considerable size were seen to be sailing. Being informed, however, that a more important

one existed near the northern "limit," it was decided to cross at once and commence the exploration by this latter channel, leaving the southern one until a better opportunity should offer. Having crossed accordingly to Pa-li-miau (a small village 8 li from Chang-tsin), that place was made the first station, and, the necessary observations for fixing its geographical position being obtained, the journey down the river was commenced from there on the 20th October—a date, by the way, so far advanced in the season as to render the greatest expedition necessary in order to complete the journey before the closing of the river by ice.

After sailing down the northern channel for about 19 statute miles a point is reached, where it is joined by the southern one, and consequently, also, by all the water which higher up floods the country lying between the two. This point is called Yü Shan, and the deep, narrow, clean-cut river-bed that receives the converging waters and leads them to the sea, is that which, 15 years ago, formed the course of the Ta-tsing.

Proceeding down-stream we pass through an open, well-cultivated country, with every here and there low dome-shaped hills, sometimes detached, sometimes in groups, and backed up by a range some 400 to 600 feet high, running nearly east and west.

Fifty-six miles from Yü Shan, by the windings of the river, bring us now to the town of Tsi-ho-hien, on the old main road to Peking, which crossed by a bridge. The bridge was swept away when the Yellow River broke into the Ta-tsing River. It is a small newly-walled unbusiness-like looking place, which, except from the circumstance of its being the site of a serious obstruction in the river, would hardly call for a word of notice. This obstruction consists of the ruins of a stone bridge of some seven arches, which at one time spanned the Ta-tsing, but which would now reach only about three-quarters of the distance across the river. There is a space between one extremity of it and the left bank, of about 100 yards, which is used by boats as the only navigable channel. The deepest portion of this 100 yards is close under the left bank, where at the time our party passed down (Oct. 21st), there was a depth of 5 feet, and no stones to be felt with the lead. The outer portion of the 100 yards channel, however, would probably not be practicable even at 3 feet.

The bridge evidently stands in deep water, six fathoms having been found immediately above it, and five a few hundred feet below it; the right bank is the steep one, and the left, near which is the channel, the shelving one, and naturally the shallow side of the reach. Its being now nothing but a wreck is, of course, due to

the additional force and volume of water in the river for the last fifteen years, which it has been unable to withstand.

It is evident that the ruins of this bridge might be removed, and, if no other obstruction existed, the river rendered navigable as far as Yü Shan, or within 19 miles of the Grand Canal. Unfortunately, however, about 3 miles below this one, there occurs another, though a less formidable obstruction, in the shape of a shoal extending right across the river. In this case, too, the deepest side of the reach is the right; and here, on the 21st of October, only 11 feet was found, the bottom rising gradually towards the left bank. On the 6th November, when this spot was passed a second time, there was but 5 feet of water in mid-stream, and allowing for the fall since the 21st of October, we should have only about 6 or 7 feet in the deep passage near the right bank. The length of the shoal would be about 200 to 300 yards, and is the only place above the bar where less than 2 fathoms was found in the deep channel.

The next point of interest we arrive at is Lokau, the port of Tsi-Nan-Foo, a long straggling unwallled town on the right bank. Tsi-Nan itself stands 12 li from the river, and not far from the foot of the main range of hills, which hereabouts average probably from 800 to 1200 feet, and form a rather picturesque background to the low, thickly-wooded plain upon which the city is built, and which extends for many miles on both sides of the river, giving to the country its characteristic feature of flat lowland. This plain is essentially alluvial, yet there rise from it in this neighbourhood several small wedge-shaped, jagged hills, or rather masses of rocks, in some cases heaped up into fantastic shapes, and the fragments near the bases worn into rounded boulders by the action of water.

Their height is inconsiderable, but being perfectly isolated, sometimes several miles of plain intervening between two of them, or between one and the main range, stamps them at a glance as the direct result of igneous action.

The trade of Tsi-nan-Foo is said to be of great importance; but, as a large proportion of it is carried on by means of cart-roads a traveller on the river has but little opportunity of forming an opinion of its magnitude. The number of boats seen at Lokau was not large, and many of them appeared to be only passing through towards the Grand Canal. The only article of commerce noticed in any quantity was salt, which had come up the river from Tië-mên-quan. Coal is met with as an article of trade, both here and at other places on the Yellow River, and is used for cooking and other purposes to, I believe, a considerable extent; it is of a rather

bituminous nature, and is sold at the rate of 1200 cash per picul in Tsi-nan-Foo. The principal mines are said to be at Tsanfan, a place in the hills 90 li to the eastward, where the coal is sold at a very much lower price than at the city.

We pass on now through a thickly wooded, well-cultivated country for about 150 miles, flat, but dry, and the soil very light and friable. The river's banks are steep, and indicate a rise in summer of 8 to 14 feet, according to the distance from the sea. The re-entering angles are everywhere much eaten into by the current, and large masses of soil are continually falling away. In many places the grain of this year having been sown up to within a short distance of the water, portions of the fields supporting the crop already sprouting have been undermined, and fallen into the stream below; thus showing that the undermining process is a very rapid one, probably more rapid this year than the experience of the inhabitants who sowed the grain led them to anticipate.

The graves near the river, or rather the coffins from them, have generally been removed to some distance back, and often to the opposite shore; the exhuming and removal being sometimes attended with great ceremony.

A few miles below Li-tsin the country begins to change its character; the well-wooded and well-cultivated district above described giving place to boundless tracts of mud and marsh, but poorly cultivated and thinly inhabited, and the whole aspect one of a bleak, swampy, treeless waste, scarcely fit for man to dwell in. Nevertheless, on the river's banks are villages, at short intervals from one another down to within 20 miles of the sea, which causes the traveller on the water to form an exaggerated opinion of the population of the district, though he is easily undeceived by walking a short distance away from the river, when it becomes apparent that on the whole the population is sparse. In fact, the only fairly habitable region is that belt of land immediately skirting the river, and from which the water of the annual flood drains itself off naturally, whilst on the tracts lying farther back it is either absorbed by the soil or remains on the surface in the shape of marshes and ponds, rendering habitation without artificial drainage almost an impossibility, except on a most limited scale.

At the limit of the habitable region, viz., about 20 miles above the sea, by the windings of the river, stands the village of Tië-mên-quan, the port of the Yellow River; and though only a village, composed like others in the neighbourhood of mud-built houses,

it has every appearance of being a most important place. It is not a centre of trade, but consists chiefly of hong's, to which traders from the different towns in the neighbourhood come to transact their business; and during the winter months, when the river is closed by ice, it is said to be nearly deserted. Now, although it is called a port, Tië-mên-quan is only used as such by small Pei-ho and Yellow River junks. Larger vessels, such as those from Ningpo, Shanghai, Lwataw, &c., never come within 20 or 25 miles of it, but remain at an anchorage outside the bar, called Tai-ping-Wan,* where they discharge their cargoes into Yellow River boats, receiving their homeward freight by the same means; thus, for these junks, Tië-mên-quan can scarcely be considered a port.

The direct trade which exists between places high up the river and Tien-tsin, Chefoo, and other ports on the Gulf, is carried on by boats of a lighter draft, and of a different construction to the sea-going junks of the southern provinces; but well suited, of course, to the rivers and shallow seas on which they are employed.

The voyage to Taku is said to occupy these boats about two days with a fair wind, that to Chefoo about four days. In both cases the journey is performed by coasting round the Gulf, and as the water for some distance from the shore is very shallow, the sea never rolls heavily, and it is always possible to anchor in the event of a foul wind.

The principal trade of Tië-mên-quan appears to be with Tientsin, which is the nearest open port, though junks, bound to and from all parts of the Gulf, are to be found there.

Tië-mên-quan, as before remarked, is on the lower limit of the habitable and salt-producing region. The country between it and the sea is an uninhabitable region—an immense mud-flat, stretching away on both sides of the river as far as the eye can reach; in the summer and autumn the greater part is covered with reeds, the more accessible of which are collected for fuel by a race of miserable reed-cutters, whilst the rest afford cover to vast numbers of wild fowl—swans, geese of two kinds, pelicans, &c. In the winter, when the reeds are gone, it must be a desert of mud, and when the river is in flood it is of course totally submerged. About 12 miles below Tië-mên-quan and half a mile from the river's left bank is a little knoll, about 10 feet above the general level, formed of sea-shells and *débris*, evidently at one time an island, and upon which stands a small brick

* "Quiet" Haven, or Bay. Anything drawing 10 or 12 feet can get over the bar at springs. "Quiet" or "Repose" Bay has 30 feet of water, a very good holding-ground. The land is not visible from it; but I believe a house and a tree can be seen.

joss-house, apparently new, and a few mud-hovels, the dwellings of reed-cutters. This place is called Lau-Ye-Miau—the only habitable spot for many miles in every direction—and is probably the point reached by the naval surveyors in 1860, and called by them Miao-Shing-pu. About 4 miles below this again we come to the bar—an object that has excited a great deal of interest amongst residents in China, it having been thought that the navigability of many hundreds of miles of the Yellow River hinged upon the depth of water to be found there. This view, however, as will be seen immediately, is not a correct one, worse obstructions existing higher up. At the date I visited it, October 27th, the least depth found was about 5 feet near the middle of the river, the water at the time being, according to the pilot who accompanied me, about a foot or 18 inches above low-water mark. The deepest channel is near the right bank, though there is one almost as deep near the left, the shallowest part being in the middle. In the former I found about 9 feet, and in the latter about 7 feet, which, at low-water springs, would give little over 7 feet and 5 feet. Several junks, drawing, it was said, $2\frac{1}{2}$ feet of water, were seen sailing through the left channel. The range of the tide would appear, on the average, to be about 2 feet—rather more at springs and rather less at neaps. Ordinary neap-floods, when the river is not in flood, are said to be perceptible for about 20 or 30 li above the bar, and springs, when favoured by the wind and a low state of the river, are sometimes noticeable as high up as Tië-mên-quan, some 60 li above it. It is, of course, obvious that a sufficiently long stay to make personal observations on the tides was impossible.

After returning to Tië-mên-quan from the bar on the 28th of October, our party had thus far examined only the section of the river included between the Grand Canal and the sea, and there still remained that portion above the Grand Canal to be explored. It was already late in the season, and before us was a journey on the Yellow River alone of some 550 miles, upwards of 400 of which was to be performed against a strong current, and in a craft scarcely suitable to the navigation. Every effort, therefore, was made to push on as rapidly as possible, and no special halts were made for any purpose, except a short one for longitude observations, until arriving at Pa-li-miau, on the Grand Canal (our first station), on the 10th November.

The river here, as before noticed, has no defined bed, but presents the appearance of a belt of country, 10 to 12 miles broad, in a state of flood—trees, ruined villages, and patches of bare mud, being all that is left of a once fertile and prosperous district. We have already

seen that this is the aspect of the river for 19 miles immediately below the Grand Canal, viz., as far as Yü Shan; and in proceeding up-stream we find another 76 miles (more or less, according to the season) of a precisely similar character, making in all a section of 95 (stat.) miles, scarcely worthy of the name of a river. Bed there is none, and at some periods of the year scarcely a channel for boats of a moderate size. It is true the natives speak of two channels, and indeed use them—a northern one and a southern one; but both were gone over during the month of November, and when I say that our boat, drawing only 15 inches of water, had often difficulty in finding a passage, little more need be said concerning the practicability of this portion of the Yellow River.

During the high-water season, junks, drawing, it is said, as much as 3 or $3\frac{1}{2}$ feet, can use the southern channel; but the journey is slow and laborious in the extreme, and whole days are frequently spent in kedging over shoals, or through places where the deposit, having found a group of trees or some other object to silt against, has commenced the formation of a mud-bank.

That there can be no great depth in this lagoon-like section of the river, is at once apparent when we consider that the same volume of water which, lower down, is contained between the banks of the narrow Ta-tsing, is here spread out over a belt of country ranging from 10 to 15 miles in width. Had this belt at any time been the site of a fairly deep river, or even a deep-dug canal, the water of the Yellow River, although at first of too great a volume to be contained in the bed of such river or canal, would, in time, have so enlarged it by means of its scouring power as to have rendered it of the necessary capacity. This, indeed, is what took place in the case of the Ta-tsing; for, as we have already seen, the bed of that stream has become both deeper and broader since the advent of the Yellow River, and now contains the whole of the latter's waters in addition to its own, and only overflows its banks at the height of the flood season. Above the Grand Canal, however, there was no river-bed of sufficient size to form the basis of a course for the Yellow River, and hence the wide-spread shallow flood instead of a defined stream.

There were, it is true, two small canals falling into the Grand Canal within 7 miles of one another: the more southerly of these, the Lun-kiang, was a very small one, only 90 li long, it is said. A portion of it was examined, and the banks in some places found to be hardly distinguishable, but everywhere the waters of the Yellow River stretching away like an overflow on both sides. To judge by the ruins of bridges, houses, and "pylams," the region through

which it flows must have been a prosperous one. At present, a few mud-and-reed hovels are the only habitations; and a few patches of wheat, sown on the mud-banks left temporarily dry by the yearly recession of the waters, the only signs of cultivation.

The second or northerly canal was of much more importance than the Lun-kiang, and, though shallow and narrow, was about 400 li (133 miles) in length. It was, and still is, called the Chau-wang-ho, and led from the old Yellow River to the Grand Canal near Pa-li-miau. The point of junction with the old Yellow River I have never been able to ascertain with any certainty; but I believe it to have been a short distance to the east of the place now called Lung-mên-kau, or the breach in the river's bank through which the Yellow waters leave their former bed. It presents, on the whole, much the same appearance as the Lun-kiang, viz., an embanked watercourse running through an inundated country. Its artificial banks were at one time at some little height above the level of the country, but they have now in most places been either carried away by the floods or worn through by the current of the Yellow River. The villages and bridges are mostly in a state of ruin, and the latter, as they reach now little more than half-way from bank to bank, are additional evidences of the power of the river to form for itself a bed, provided only that it finds a sufficiently durable basis to work upon. Durability in that case, however, is wanting; and even had the Chau-wang been many times its original breadth, it would still have been useless as a channel for the Yellow River, the artificial embankments being naturally unfitted to withstand the scouring process. As it is, the canal is only traceable here and there for a few miles at a stretch; and, as its course through the belt of country at present occupied by the river was a winding one, the portions now left are, as it is only natural to suppose, those whose direction was identical, or nearly so, with that taken by the Yellow River.

A distance of 76 miles, then, by the southern channel, from the Grand Canal, brings us to a point where we find the Yellow waters again flowing in a defined channel, which is traceable as far as the old bed, a distance of about 52 (statute) miles. At the low-water season this channel contains the whole Yellow River; but as the banks in the highest places are no more than about 10 feet above the November level, it can contain during the flood season only a portion of it.

Now, although when the banks are at 10 feet above the level of the water this channel has the appearance of being the permanent bed of the river, yet, so far from thinking it permanent, I should

hesitate even to call it a "bed" at all; for the banks—and, indeed, the country for miles on each side—are composed of the river's own deposit, which seems rather to have silted to a certain elevation above the river-level than that the water had cut a bed for itself in the soil to a corresponding extent.

Between the point at which the Yellow River changed its course and the Grand Canal the land must be very low relatively to the sea-level. At the time of the change, and in some subsequent severe floods, many villages far inland were buried by the deposit up to the eaves of the roofs. In some places the deposit is silicious sand, and in others an impalpable yellow earth. It sometimes improves and in others deteriorates the pre-existing soil.

It is almost superfluous to say that the country thus formed of the river's deposit is a perfect level, and that the soil is very light and mobile; and though the flood of each successive year, by adding more deposit, increases the stability, yet a powerful stream like the Yellow River can, I imagine, hardly be thought to have adopted a permanent course when the nature and height of its banks, the character of the adjoining country, the extent of its annual overflows, &c., are taken into consideration.

Perhaps the most striking proof that the banks and neighbouring country are the creation of the river's deposit rather than that the channel is a natural excavation, is that of the buried or silted-up houses, which, besides, is a circumstance of interest in other respects: as, for instance, that it goes to show the power of the Yellow River in changing the configuration of the country with which its waters come in contact. The houses are frequently silted-up nearly to the eaves, and have generally been abandoned; but few dug out. As an example of this I may mention a joss-house, within a few yards of a point on the river where the level of the deposit was some 10 feet above that of the water. To enter this joss-house it was necessary to crawl under the eaves, and, when inside, it was evident from alterations that had been made in the doorway, &c., that for some time the inhabitants had attempted to accommodate themselves to the constantly diminishing height of the building. The *severe* floods are not annual: one took place about 1855, and the next about 1862 or 1863.

So little used is the Yellow River above the Grand Canal, and the navigation on it so little understood, that the people living near its banks, and even the boatmen themselves, seldom know the distance from one place to another by the river, but always speak of distances by the road, and even then two rarely agree, showing of what little importance the river is regarded as a means of com-

munication, even though no roads worthy of the name exist in its neighbourhood.

A somewhat tedious journey of a fortnight from the Grand Canal, brought our party, on the 24th November, to Lung-mên-Kau, the diverging point of the old and new courses of the Yellow River, and the upper limit of the exploration.

The breach in the embankment of the old river is about a mile in width, and the present channel runs, as it were, diagonally through it. The two banks at this point are about three miles apart; near the northern one there is a depression about a quarter of a mile broad, full of small sand-hills, the only part of the old bed having any appearance of a dried-up watercourse; this was the main, or low-water, channel of the old river, the artificial outer embankments marking only the limit attained during the annual floods.

By a mere cursory inspection of the neighbourhood of the breach, the cause of the Yellow River's change of course is at once apparent. The river had so diminished the capacity of its bed (which, by the way, was always an artificial one) by depositing the alluvium with which its waters were charged, that the main pressure during the flood season had come to bear on the upper, or weaker, part of the embankments; and no measures having been taken to strengthen these, or deepen the channel, the great catastrophe happened, which, with its consequences, had been predicted by the Abbé Huc some years before—a catastrophe which has caused not only the devastation by flood, of that line of country through which the river now flows, but has also impoverished to such an extent the districts through which it formerly flowed, and which were dependent upon it for irrigation, as to render them almost uninhabitable, and to throw a great portion of the population out of employment.

Lung-mên-Kau is a small village built along the north bank of the old river east of the breach. About 90 li w.s.w. of it stands Kai-fung-fu (or Pien-liang-ching, as it is more generally called), the capital of Honan. A road leads down the old bed, through Lan-I towards the south, and boats bringing cargoes down the river sometimes discharge them at Lung-mên-Kau for conveyance by waggon to towns in that direction. Some of these boats bring small quantities of good anthracite coal from the neighbourhood of Hoai-king-fu.

After leaving Lung-mên-Kau, the river was followed down as far as the Grand Canal, which was reached on the 30th November. It had been intended, as before remarked, to have examined the channel which leads from Nan Shan (on the Grand Canal) to Yü

Shan, and runs near the southern "limit" of the river; but the fall of water had been so great since the first view of this channel was obtained on the 17th October, that it had become impracticable for all but the smallest boats; and, seeing that the ice had already begun to form on the shallow waters of the river, it was thought advisable rather to leave this channel unexamined than incur the risk of being frozen in, and having to transport the time-keepers overland.

At Nan Shan, therefore, on the 1st December, the exploration came to an end, and the party, returning by way of the Grand Canal, arrived at Chinkiang on the 15th December.

To sum up shortly the capabilities of the Yellow River for navigation, it would seem that a vessel of sufficiently light draft to cross the bar would have no difficulty in ascending the river during all but the lowest point of the season as far as Tsi-ho, a distance approximately of 210 statute miles from the bar, and were the ruins of the bridge at that place removed, a further distance of 56 miles would be rendered navigable, making in all 266 (stat.) miles from the bar to Yü Shan. All beyond Yü Shan, as far as Lung-mên-Kau, must be regarded as totally unnavigable, except perhaps the 19 miles between Yü Shan and the Grand Canal, which could be used during the high-water season.

The yearly rise or fall is greater in some years than in others, but taking the November level of last year (1868) as a base, and judging of the former by the indications of the banks and other signs, and of the latter from native information, I should think that a yearly range of 20 or 22 feet would not be far from the mark. Both rise and fall take place very irregularly, and it is said that a fall of three feet in one day is a common occurrence, especially towards the approach of winter.

As in the first paragraph of this paper, mention was made of a southern outlet of the Yellow River existing at the present day, it must be explained here that this was caused directly by a rupture of the south bank of the old river near Yan Kiau in Honan, about 150 li above Kai-fung-fu, which occurred in July last (1868).^{*} Not having visited the spot, my information on this subject is, of course, derived from the natives, who report that the bank is carried away for about 3 li, and that the water of the Yellow River flowing through the breach floods a large tract of country outside the bank, and then finds its way into a small river called the Sha, a tributary of the Wai, which latter flows into the Hung-tsze Lake. It is said

^{*} About 1843 a breach occurred in the south bank still higher up, and is spoken of as one of the premonitions of the late change.

that the authorities are trying to repair it in time for next summer's flood, about a third of the work being finished in November; and the common belief is that when the upper one has been closed, the lower one will be taken in hand, and the river made to flow along its old course to the sea.* This, however, would appear to be impossible as long as the old bed remains at its present level, and to deepen it or to raise the embankments would be equally impossible in the present disorganised and impoverished state of the country. On the 22nd November, while proceeding up the Yellow River, I had a corroboration of the statements of the natives regarding communication with the southern waters, by meeting five or six Hung-tsze boats, whose people said they had come from Ying-Chow (or Hing-Chow) in Kiang-nan, by way of the Sha. These boats were said to draw about $1\frac{1}{2}$ foot of water, but as they were dropping down with the current no information could be obtained concerning the Sha, or the communication between the Yellow River and the Hung-tsze—a matter of great interest, as, should a permanent communication be found to exist, the Yellow River will have to be regarded as *in part* nothing more than a tributary of the Yang-tzse—for into the Yang-tzse the Hung-tze Lake discharges. The amount of water parted with through the new breach I believe to be very inconsiderable.

The paper will be published entire, with the author's chart, in 'Journal,' vol. xl.

The PRESIDENT explained that the author of the paper that had just been read was a young man engaged in business in China, who had, in a most praiseworthy and energetic way, occupied his autumnal holiday last year in making this most interesting survey. The manner in which it had been carried out merited the most hearty commendation. Mr. Elias had drawn up the charts of the river exhibited that evening with his own hands, and had delineated many hundreds of miles of territory, gathering information respecting one of the most remarkable physical changes that had taken place in modern times.

Captain SHERARD OSBORN, R.N., said Mr. Elias had not only given an interesting account of the new course of the Yellow River, but for the first time had presented geographers with an accurate map, with positions fixed astronomically and soundings throughout. Mr. Wylie had been the first to tell us of the fact of the old bed of the Yellow River being dried up; and, subsequently, Mr. Lockhart, in a paper read before the Society, had guessed, as it proved with accuracy, that the river had returned to one of its old beds, discharging its waters into the Gulf of Pecheli. These gentlemen had made us well acquainted with this part of the river-system of Central China. Recently, Mr. Swinhoe had ascended the Yang-tsze-kiang, with Admiral Keppel

* This would be no improvement, even if it were possible. The present course is more navigable, as above stated, for 200 miles, than it would be possible to make the other.

and two delegates from the Chamber of Commerce at Shanghai, 400 miles above Hankow, and they had forwarded excellent geographical information, combined with a great deal that was most interesting to the merchant and the politician, giving not only a description of the river, but of the products of that part of the country, which might be called the second plateau of the river-system of Central China. The first or lower plateau traversed by those magnificent streams Yang-tsze and Hoang-ho, consisted of the well-known alluvial plain, called the Great Plain of China, extending as far westward as Hankow and thence northward in a line towards Peking. Its area, equal to that of France, in 1813 supported a population of 170 millions, and it was probably the richest region of the earth, so far as soil and products were concerned. Above the Great Plain was a second plateau, between the borders of China Proper and this Plain—a great *terra incognita* for the most part, so far as we are concerned. Captain Blakiston traversed it in a boat, and now the Shanghai merchants sent us more information. Athwart this second plateau the great rivers flowed swiftly, carrying the *débris* of the mountains down to the first plateau or great plain, formed of the rich alluvial soil thus deposited. But it was worthy of note that the large and rapid rivers which created and fertilized this plain required to be held in hand by the skill of the engineer. The Yang-tsze-kiang from time immemorial had been the means of communication across the empire, and it was to that river that Europeans were indebted for access into the interior of China. Parallel to it, and branching in all directions, was a perfect net-work of canals—the roads of China. The Hoang-ho had an entirely opposite character; it was as turbulent at its source as at its mouth, so that the people living on its shores hardly ever used it as a means of communication. Every traveller confirmed this account; but he thought, if European engineering talent were set to work upon this river, that we could utilise its waters. The Great Canal had gone out of repair from the general misgovernment of the country. The canal only required to be reconstructed, and the surplus waters of the Hoang-ho would again be made available. As far back as 1818 the Chinese censors pointed out how difficult it was to restrain this stream. He found, from Mr. Wade's papers, that in 1821 the river was maintained for a sum per annum, which by 1850 was quintupled, still the river could not be kept within bounds. The Hoang-ho—indeed all China—offered a field for the surplus engineering talent of Great Britain. It was a melancholy fact that, owing to the inundations of the Hoang-ho, as many as 40 or 50 millions of people had lost their lives in the last 15 years, yet mandarins talked of how their people would suffer if improved engineering works were introduced. Mr. Wylie had ascended the upper portion of the Yang-tsze from Hankow to Seu-chow, then made a considerable curve and struck the watershed of the Han, and came down to Hankow, traversing a most interesting region, interesting as being the original seat of the Chinese race. Mr. Swinhoe's elaborate report told us that, if the Chinese would only throw open the upper waters of the Yang-tsze-kiang as they had thrown open the lower, there was no doubt steamers could force their way up the rapids, and give us access to the magnificent province of Szechuen. He hoped the day was not far distant when the treaty made by Lord Elgin would be carried out in its integrity, for every step we made into China would be for the benefit of its people, and for the benefit of our own country as well.

THE PRESIDENT said Captain Sherard Osborn had spoken on a topic which was really his own, for it was well-known that it was he who took Lord Elgin up to Hankow. As Mr. Wylie was present, and the paper contributed by him could not be read, owing to the shortness of time, he hoped that gentleman would make some observations.

MR. WYLIE said Captain Osborn had correctly pointed out the route he had pursued from Hankow up the Yang-tsze-kiang as far as Seu-chow, and thence to the capital of Sze-chuen. Captain Blakiston had already described,

in his well-known work, the course of the Yang-tse-kiang and its characteristics, as far as Seu-chow. At that point he (Mr. Wylie) left the Yang-tse, and ascended the Min, a very considerable river, as far as Chingtu; there were, however, many shallows in it, and it was not fit for steam navigation. It would be needless for him to describe in detail the route he had pursued. He and his party travelled over the great plain of Chingtu, for some two days after leaving the capital. It was a mere mud-flat, principally paddy-fields, with a great traffic across it. This was succeeded by a range of low hills, over which they passed in several days' journey, and subsequently crossed a much higher range. They proceeded thence to the Han River, by which they descended to the city of Hanchung, a few miles above which the navigation of the Han begins. This is a very important river, inasmuch as at certain portions of the year the traders find it necessary to follow that course, instead of pursuing the navigation of the Yang-tse-kiang, owing to the rapids and the rise of water in the gorges, which render the navigation of the latter at those periods difficult and dangerous. Ascending the Han as far as the district city of Meen, by a journey of about 40 miles over the hills, they reach the Kealing River, from which they again descend to the region of the Yang-tse-kiang, and thus avoid all the gorges and rapids. He was exceedingly pleased to hear the good opinion expressed regarding the labours of Mr. Elias, who was a most conscientious explorer and a thoroughly reliable authority. In the course of his wanderings through China, he (Mr. Wylie) had on various occasions come in contact with the Yellow River. The first time was in 1854. Indistinct rumours had reached Shanghai with regard to the gradual diminution of the waters in the river. But on reaching the bank of the old channel, he was surprised to find that, instead of the mighty stream that used to flow there, it was entirely a broad, dry, sandy bed, traversed as a high road by innumerable passengers, and a most singular scene it was. He believed he was the first European to bear witness to that fact. To ascertain where the water was gone to was not so easy; so to speak, it had gone nowhere, but had scattered itself over a large tract of country, without settling into any bed at all, spreading desolation over many miles and utterly destroying a great number of towns, villages, and hamlets. About nine years after that, when on a journey from Teen-tsin to Chefoo, he crossed the waters of the Yellow River. Had it not been the depth of winter, and consequently the low-water season, he would have had considerably greater difficulty in getting through. He found the waters distributed over the country in lagoons and marshes; they had scarcely concentrated themselves into any regular channel, but were converging towards the Ta-tsing River. In consequence of the water spreading out, he had to diverge from the highway seaward, and even then met with a slight disaster at one place. When about three-parts over a broad sheet or ice, his cart getting on a thin place, went through, thus putting him for a time in an awkward predicament, until helped out by some casual passers, to whom such occurrences were apparently no novelty. Since then, the waters seemed to have become more collected and settled in one regular channel. Again, about three years ago, whilst on a journey from Hankow to Peking overland, he had occasion once more to cross the Yellow River, directly north of the city of Kae-fung. The river there was a black, slow-running stream, about one-third of a mile broad. There was no traffic except that of the ferry-boats crossing it with a great number of passengers to and fro. The northern bank of the river was a long sandy slope, a mile and a half broad, so that in summer time, when the waters are high, the river must be very much broader. He believed there was never any great traffic along that part of the river. The paper which had just been read described the condition of the river at the present time. The name of that portion south of the Grand Canal, which Mr. Elias had given in Chinese, meant "the old Yellow River." So that it was actually a portion of the old bed which the river occupied before it flowed in the late channel

occupied previous to the one it had recently made. Mr. Elias seemed to hint that there was no security for the river remaining in its present position. There was another condition which might be noticed. It was asserted by the Chinese, and he believed it was confirmed by geologists, that the bed of the Gulf of Pecheli with the adjoining coast-line (and the mainland, to what extent from the sea is not known) was gradually rising at the rate of six feet in a century. This must exercise a great influence upon the course the river would take.

The PRESIDENT.—On what authority do you state that?

Mr. WYLIE said the Chinese stated so; and Mr. Bickmore, an American professor, who visited that part of the country last year, had stated that the bed of the gulf was rising at the rate of six feet.

The PRESIDENT.—As I understand you, the ground is rising very much in the Gulf of Pecheli. But this river, which we are hearing of now, has found its issue into that gulf which you say has been rising. I do not understand that.

Mr. WYLIE said this was what he read in the reports of geologists. They had heard of the changes that had taken place at various periods. Perhaps it might not be generally known that the lower portion of the bed that the river had lately occupied was actually the entrance of the River Wei; from the Grand Canal up to the sea-coast, it had actually usurped the bed of the Wei, and was still called the Wei by the Chinese on the spot. Since the closing up of its mouth the Wei had run into the Hung-tsil and other lakes bordering the Grand Canal on the west. Of late years these lakes have been gradually extending their dimensions in consequence; and as the natural outlet for their waters is the Yang-tsze River, it may possibly become a question whether the extension of the flood season about Hankow and upwards is in any degree attributable to such an influence.

Mr. LOCKHART expressed his satisfaction that the great work which he had so long desired had been accomplished, namely, the survey of the northern mouth of the Yellow River. Some years ago he read a paper on the subject before this Society.* Mr. Elias' investigations proved, what the Chinese had long asserted, that the Yellow River, during its frequent changes, had found its way most often to the north. The historical mouth of the Yellow River was the southern one, with which we were well acquainted, but the Chinese knew the river much better by its northern course. He might state that there was no river in the world that had been so much written about as the Yellow River. The histories of their rivers written by the Chinese were remarkable for the fulness of their descriptions and the accuracy of their maps. There had been some divergence of the various northern mouths, probably to the extent of 100 miles, to the northward, and a little to the south of the Ta-tsing River. The Yellow River had ever been the trouble of China: it had cost them many millions at various times, and it had often been called "The Sorrow of the Children of Han." When China was thrown more open to commercial intercourse, we might hope that our engineering science might be brought to bear upon confining that river within its own bed. As they had heard, it was bearing out its name in the present generation, many millions of people having been completely destroyed by the present irruption of the Yellow River to the northward. He also wished to say that, within the last few years, we have had some remarkable journeys undertaken by Englishmen in different parts of China. They had heard what Captain Blakiston had done; and he was proud to hear of the journey which his friends—Mr. Wylie and Mr. John—had made. It might be interesting to mention that Mr. Wylie believed he had identified the White Horse Pass which Marco Polo went

* Drawn up from information received from the Chinese, and also from Mr. Wylie, after his visit to the dry bed of the Yellow River in 1857.

through in one of his journeys in China. This would be a subject of interest to the President and to Colonel Yule. Journeys had also been made by Mr. Lees and Mr. Williamson to Sigan-fu, in Shensi, where they had seen the celebrated Christian inscription erected about the year 1200 A.D.; by Mr. Morrison, from Peking to Hankow, and by various consuls, merchants, and missionaries throughout the length and breadth of the empire.

Mr. SAUNDERS wished to correct an inaccuracy in Mr. Elias' paper, and to allude to a previous journey to the new course of the Yellow River. Mr. Elias remarked that the new course of the Yellow River had never yet found its way into modern maps. He begged to say that it had done so in several maps that he was acquainted with; and that the information was derived from the journey of Mr. Morrison, son of the famous Dr. Morrison. He touched the new course of the Yellow River at various points by land, and effectually fixed its direction. Mr. Morrison had partly prepared a paper on his journey, but he had been unable hitherto to lay it before the Geographical Society owing to his feeble health.

The PRESIDENT congratulated the Society upon the importance of the discussion which had followed the reading of Mr. Elias' admirable paper. With regard to what had fallen from Mr. Saunders, no doubt it was quite right to render all honour to Mr. Morrison for what he had done; but no one, that he had ever heard of, had delineated the new course of the river as Mr. Elias had done. He agreed with Captain Sherard Osborn that the great internal water-communication of China was now much better known to us, owing to modern English explorers; and he could only add that, if there was any country in the world where civil engineers could be most successfully and serviceably employed, this was the region, where by erecting comparatively little mounds of earth they could deflect the channel of the rivers, and so materially affect the conditions of the whole surface of the country. The physical features of China under consideration, *i.e.*, those great alluvial plains which were the characteristics of the country, were chiefly due to the action of great rivers, and very slight deviations necessarily produced great changes in flat and undulating regions. As an old geologist, however, he retained his former opinion that the great alterations in the configuration of the earth's surface were brought about by causes on a very different scale indeed from those which operate now. The physical changes which were taking place in China, though considerable in extent of surface, were puny in comparison with the grand agencies of elevation and subsidence which were at work in former times.

Third Meeting, December 13th, 1869.

SIR RODERICK I. MURCHISON, BART., K.C.B., PRESIDENT, in
the Chair.

PRESENTATIONS.—*Theophilus Horrex, Esq.*; *B. C. Stephenson, Esq.*; *Iltudus T. Pritchard, Esq.*

ELECTIONS.—*Richard Vicars Boyle, Esq.*, M.I.C.E., &c.; *George Frederick Browning, Esq.*; *Louis Blacker, Esq.*; *William H. Colville, Esq.* (Surgeon H.M. Indian Army); *Douglas W. Freshfield, Esq.*; *Dr. Andrew Graham* (Staff-Surgeon R.N.); *Charles Horne, Esq.*; *Alexander Bennett M'Grigor, Esq.*; *T. G. A. Palmer, Esq.*; *James*